

ABSTRACT OF THE DISCLOSURE

5 A new polymerization process (atom transfer radical  
polymerization, or ATRP) based on a redox reaction between a  
transition metal (e.g., Cu(I)/Cu(II)), provides "living" or  
controlled radical polymerization of styrene, (meth)acrylates,  
and other radically polymerizable monomers. Using various  
simple organic halides as model halogen atom transfer  
precursors (initiators) and transition metal complexes as a  
model halogen atom transfer promoters (catalysts), a "living"  
radical polymerization affords (co)polymers having the  
predetermined number average molecular weight by  $\Delta[M]/[I]_0$  (up  
to  $M_n > 10^5$ ) and a surprisingly narrow molecular weight  
distribution ( $M_w/M_n$ ), as low as 1.15. The participation of  
free radical intermediates in ATRP is supported by end-group  
15 analysis and stereochemistry of the polymerization. In  
addition, polymers with various topologies (e.g., block,  
random, star, end-functional and in-chain functional  
copolymers [for example, of styrene and methyl  
(meth)acrylate]) have been synthesized using the present  
20 process. The polymeric products encompassed by the present  
invention can be widely used as plastics, elastomers,  
adhesives, emulsifiers, thermoplastic elastomers, etc.

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